

User's Guide to IEC Type 1 and Type 2 Coordination

Application Note

November 2005
New Information



Manual Motor Controller



Series G Molded Case Circuit Breaker



XT Starter

What is it?

The International Electrotechnical Commission (IEC) developed short circuit performance criteria for contactors and starters called Type 1 coordination and Type 2 coordination. This defines motor controller protection levels following a short circuit fault. In order to achieve this performance, the combination of a motor controller (contactor or starter) and short circuit protective device (manual motor protector, circuit breaker or fuse) must meet the following criteria as specified by IEC 60947-4-1 — Low voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters:

Type 1 Coordination requires that under short circuit conditions, the contactor or starter shall cause no danger to persons or installation and may not be suitable for further service without repair and replacement of parts.

In this case, *significant damage is allowed* to the contactor/starter (e.g. contact welding, burning, or disintegration) and the overload relay (e.g. component harm or heater element burn-out).

Type 2 Coordination requires that under short circuit conditions, the contactor or starter shall cause no danger to persons or installation and shall be suitable for further use. The risk of contact welding is recognized, in which case the manufacturer shall indicate the measures to be taken as regards to the maintenance of the equipment.

In this case, the contactor/starter is *able to continue use* after the occurrence of a short circuit fault. Light contact burning or tack welding may occur provided the contacts are easily separable.

Who benefits and why?

Achieving an acceptable level of short circuit coordination requires knowledge about the application, product standards, installation codes and the attributes of the many short circuit protective devices (SCPDs) that are available. Extensive testing must be completed and certified in order to achieve a Type 1 or 2 rating. IEC 60947-4-1 offers precise definitions of allowable damage in order to guide users to the right product with the right protection.

Generally speaking, most users expect Type 2 protection in their applications. With certifying agencies varying from country-to-country and continent-to-continent, users will sometimes mistakenly assume that Type 2 coordination has been achieved if their motor branch circuit components are CE marked, UL Listed Type E or F and/or CSA Certified. This is not necessarily true.

At the forefront of Type 2 benefits comes the assurance that the device poses no threat of danger to the person or installation. Furthermore, with increased emphasis placed on reducing downtime to increase productivity, proper application and selection of motor branch circuit devices is more important than ever. By selecting the proper type of protection, the working environment and employees can be protected against hazardous fault conditions and the performance of contactors and overload relays in the branch circuit can be maximized.

Type 2 protection provides confidence that motor control components will be operable following a short circuit fault. This reusability translates into hundreds or even thousands of dollars in savings due to reduced downtime and replacement costs.

TYPE 2 Coordination = Safety + Less Downtime = Dollars and Cents

How does Eaton comply?

It is important to understand the short circuit testing pass/fail criteria of the applicable product standards (UL 508, CSA C22.2 No. 14 and IEC 60947) when specifying products for each application. Each standard requires that devices are capable of withstanding minimum short circuit currents (based on the starter's rating). UL and CSA refer to the minimum rating as the Standard Fault Short Circuit Current Rating. IEC 60947-4-1 and 60947-6-2 refer to these ratings as I_r and I_{cr} respectively.

Standard Fault Short Circuit Current Rating (Derived from UL 508): The minimum short circuit current, based on horsepower rating, that a starter must be capable of withstanding in accordance with the applicable pass/fail criteria. Denoted as I_r by IEC 60947-4-1 and I_{cr} by IEC 60947-6-2.

Manufacturers may also specify short circuit ratings exceeding the minimum ratings required by standards. UL and CSA refer to these as the High-Available Fault Short Circuit Current Rating. IEC 60947-4-1 and 60947-6-2 refer to these ratings as I_q and I_{cs} respectively.

High-Available Fault Short Circuit Current Rating (Derived from UL 508): The short circuit current rating specified by the manufacturer of a motor controller, which is greater than the standard short circuit current rating. The motor controller is capable of withstanding the high-available short circuit current in accordance with the applicable pass/fail criteria. Denoted as I_q by IEC 60947-4-1 and I_{cs} by IEC 60947-6-2.

Following is a summary of short circuit testing pass/fail criteria applicable to magnetically operated direct-on-line contactors and starters. Standards should be referenced for exact wording and all specific pass/fail criteria. UL and IEC criteria are summarized for standard and high-available short circuit currents. CSA criteria are summarized for high-available short circuit currents.

Table 1. Defining Pass/Fail Criteria: UL 508/CSA C22.2 No. 14 and IEC 60947-4-1

	UL and CSA	IEC 60947-4-1	
		Type 1	Type 2
Fault Current	Fault current is successfully interrupted and no arcing to enclosure or proximity barrier is indicated by an open ground wire or fuselink.		
Enclosure	No substantial damage to the enclosure. It may be deformed but it must be possible to open the door. Live parts shall not be accessible.		
Terminals and Conductors	No damage to conductors or terminals. Conductors must not be separated from the terminals.		
Contactors/Starter Housing	No cracking or breaking of the contactor/starter housing that impairs the integrity of the mounting of live parts.		
Short Circuit Protective Device (SCPD)	The circuit breaker or switch must be capable of being operated manually. SCPD is not separated from its mounting means. Fuses must not rupture.		
Contactors/Starter Contacts	Welding and complete disintegration acceptable.	Welding acceptable.	Welding acceptable provided contacts can be easily separated.
Overload Relay	Electronic overload relays must be operable; tripping characteristics must be verified (UL). Mechanical overload relays may be damaged, if so, device must include markings indicating that (UL).	Damage acceptable.	No damage, tripping characteristics must be verified.
Contactors/Starter Operation	May be inoperable.	May be inoperable.	Must be operable, verified by 10 operations after short circuit test.
Other	No discharge of parts from enclosure. No risk of fire.	No discharge of parts from enclosure. Must pass 2X rated voltage, 1000V minimum dielectric test.	No discharge of parts from enclosure. Must pass 2X rated voltage, 1000V minimum dielectric test.

What branch circuit devices do you need for Type 2?

Achieving Type 2 is straightforward when using the following selection tables. Follow these steps to ensure that Type 2 coordination is in place:

- Step 1: Determine the motor Horsepower or kW (single or three phase) or full load motor current from the motor nameplate.
- Step 2: Verify the motor full load amps are less than or equal to the operational current (I_e) listed next to the hp or kW in the table.
- Step 3: **Manual Motor Controllers (MMC):** Read across the tables horizontally for catalog numbers of the Manual Motor Protector (MMP) and contactor (customer assembly) or pre-assembled Manual Motor Controller.

Note: For certain horsepower at 480V and 600V, a current limiter must be used to achieve the maximum Type 2 rating (shown in the following tables). Customers can either order the MMP and Current Limit Contactors or an assembled MMC and current limiter.

Circuit breaker combination controllers: Read across the tables horizontally to determine the catalog numbers of the circuit breaker to be used in conjunction with the contactor and overload relay listed (customer assembly) or the pre-assembled motor starter.

Fused combination controllers: Read across the tables horizontally to determine what amperage size fuse (customer to specify brand) and the catalog numbers of the contactor and overload relay or the pre-assembled motor starter.

Manual Motor Controller Combinations

Table 2. 400/415V Type 2 Coordination — MMC

P (kW)	I_e (A)	I_g (kA)	MMP Catalog Number	Contactor Catalog Number ②	MMC Catalog Number ②
0.06	0.21	50.00 (150.00) ①	XTPRP25BC1	XTCE007B10_	XTSCP25BB_
0.09	0.31	50.00 (150.00) ①	XTPRP40BC1	XTCE007B10_	XTSCP40BB_
0.12	0.41	50.00 (150.00) ①	XTPRP63BC1	XTCE007B10_	XTSCP63BB_
0.18	0.60	50.00 (150.00) ①	XTPRP63BC1	XTCE007B10_	XTSCP63BB_
0.25	0.80	50.00 (150.00) ①	XTPR001BC1	XTCE007B10_	XTSC001BB_
0.37	1.10	50.00 (150.00) ①	XTPR1P6BC1	XTCE007B10_	XTSC1P6BB_
0.55	1.50	50.00 (150.00) ①	XTPR1P6BC1	XTCE007B10_	XTSC1P6BB_
0.75	1.90	50.00 (150.00) ①	XTPR2P5BC1	XTCE007B10_	XTSC2P5BB_
1.10	2.60	50.00 (150.00) ①	XTPR004BC1	XTCE007B10_	XTSC004BB_
1.50	3.60	50.00 (150.00) ①	XTPR004BC1	XTCE007B10_	XTSC004BB_
2.20	5.00	50.00 (150.00) ①	XTPR6P3BC1	XTCE007B10_	XTSC6P3BB_
3.00	6.60	50.00 (150.00) ①	XTPR010BC1	XTCE018C10_	XTSC010BC_
4.00	8.50	50.00 (150.00) ①	XTPR010BC1	XTCE018C10_	XTSC010BC_
5.50	11.30	50.00	XTPR012BC1	XTCE018C10_	XTSC012BC_
7.50	16.00	50.00	XTPR016BC1	XTCE018C10_	XTSC016BC_
11.00	21.70	50.00	XTPR025BC1	XTCE025C10_	XTSC025BC_
15.00	29.30	50.00	XTPR032BC1	XTCE032C10_	XTSC032BC_
5.50	11.30	50.00	XTPR016DC1	XTCE018C10_	XTSC016DC_
7.50	16.00	50.00	XTPR016DC1	XTCE018C10_	XTSC016DC_
11.00	21.70	50.00	XTPR025DC1	XTCE025C10_	XTSC025DC_
15.00	29.30	50.00	XTPR032DC1	XTCE032C10_	XTSC032DC_
18.50	36.00	50.00	XTPR040DC1	XTCE040D00_	XTSC040DD_
22.00	41.00	50.00	XTPR050DC1	XTCE050D00_	XTSC050DD_
30.00	55.00	50.00	XTPR058DC1	XTCE065D00_	XTSC058DD_
34.00	63.00	50.00	XTPR063DC1	XTCE065D00_	XTSC063DD_

① Values in parentheses () are for Type 1 Coordination.

② Underscore (_) indicates magnet coil suffix required. See Table 9, Page 7.

Table 3. 480V Type 2 Coordination — MMC

P (hp)	I _e (A)	I _q (kA)	MMP Catalog Number	Current Limiter Catalog Number	Contactor Catalog Number ③	MMC Catalog Number ③
1/2	0.24	65.00	XTPRP25BC1		XTCE007B10_	XTSCP25BB_
1/2	0.32	65.00	XTPRP40BC1		XTCE007B10_	XTSCP40BB_
1/2	0.51	65.00	XTPRP63BC1		XTCE007B10_	XTSCP63BB_
1/2	0.74	65.00	XTPR001BC1		XTCE007B10_	XTSC001BB_
1/2	0.94	65.00	XTPR001BC1		XTCE007B10_	XTSC001BB_
3/4	1.32	65.00	XTPR1P6BC1		XTCE007B10_	XTSC1P6BB_
1	1.72	65.00	XTPR2P5BC1		XTCE018C10_	XTSC2P5BC_
2	2.55	65.00	XTPR004BC1		XTCE018C10_	XTSC004BC_
2	3.10	65.00	XTPR004BC1		XTCE018C10_	XTSC004BC_
3	4.55	65.00 (50.00) ②	XTPR6P3BC1	XTPAXCL	XTCE018C10_	XTSC6P3BC_
3	6.15	65.00 (50.00) ②	XTPR6P3BC1	XTPAXCL	XTCE018C10_	XTSC6P3BC_
7-1/2	8.40	65.00 (50.00) ②	XTPR010BC1	XTPAXCL	XTCE018C10_	XTSC010BC_
7-1/2	11.00	65.00 (50.00) ②	XTPR012BC1	XTPAXCL	XTCE018C10_	XTSC012BC_
10	14.50	65.00 (50.00) ②	XTPR016BC1	XTPAXCL	XTCE018C10_	XTSC016BC_
10	20.00	65.00 (50.00) ②	XTPR020BC1	XTPAXCL	XTCE025C10_	XTSC020BC_
20	20.00	65.00	XTPR025DC1		XTCE040D00_	XTSC025DD_
25	27.00	65.00	XTPR032DC1		XTCE040D00_	XTSC032DD_
25	32.00	65.00	XTPR032DC1		XTCE040D00_	XTSC032DD_
30 ①	37.50	65.00	XTPR040DC1		XTCE040D00_	XTSC040DD_
30 ①	50.50	65.00	XTPR058DC1		XTCE065D00_	XTSC058DD_
40 ①	64.00	65.00	XTPR063DC1		XTCE065D00_	XTSC063DD_

① Pending UL approval.

② Values in parentheses () are achieved without the current limiter.

③ Underscore (_) indicates magnet coil suffix required. See Table 9, Page 7.

Table 4. 600V Type 2 Coordination — MMC

P (hp)	I _e (A)	I _q (kA)	MMP Catalog Number	Current Limiter Catalog Number	Contactor Catalog Number ⑥	MMC Catalog Number ⑥
1/2	0.19	50.00	XTPRP25BC1		XTCE007B10_	XTSCP25BB_
1/2	0.26	50.00	XTPRP40BC1		XTCE007B10_	XTSCP40BB_
1/2	0.41	50.00	XTPRP63BC1		XTCE007B10_	XTSCP63BB_
1/2	0.59	50.00	XTPRP63BC1		XTCE007B10_	XTSCP63BB_
1/2	0.75	50.00	XTPR001BC1		XTCE007B10_	XTSC001BB_
1	1.06	50.00	XTPR1P6BC1		XTCE007B10_	XTSC1P6BB_
1	1.38	50.00	XTPR1P6BC1		XTCE007B10_	XTSC1P6BB_
1-1/2	2.04	50.00	XTPR2P5BC1		XTCE018C10_	XTSC2P5BC_
1-1/2	2.48	50.00	XTPR2P5BC1		XTCE018C10_	XTSC2P5BC_
3	3.64	50.00	XTPR004BC1		XTCE018C10_	XTSC004BC_
5	4.92	50.00 (18.00) ⑤	XTPR6P3BC1	XTPAXCL	XTCE018C10_	XTSC6P3BC_
10	6.72	50.00 (18.00) ⑤	XTPR010BC1	XTPAXCL	XTCE018C10_	XTSC010BC_
10	8.60	50.00 (18.00) ⑤	XTPR010BC1	XTPAXCL	XTCE018C10_	XTSC010BC_
10	11.50	50.00 (18.00) ⑤	XTPR012BC1	XTPAXCL	XTCE018C10_	XTSC012BC_
10	16.00	50.00 (18.00) ⑤	XTPR016BC1	XTPAXCL	XTCE018C10_	XTSC016BC_
25	21.50	50.00	XTPR025DC1		XTCE040D00_	XTSC025DD_
30	25.50	50.00	XTPR032DC1		XTCE040D00_	XTSC032DD_
30	30.00	50.00	XTPR032DC1		XTCE040D00_	XTSC032DD_
40 ④	40.50	50.00	XTPR050DC1		XTCE050D00_	XTSC050DD_
40 ④	51.00	42.00	XTPR058DC1		XTCE065D00_	XTSC058DD_
50 ④	61.00	42.00	XTPR063DC1		XTCE065D00_	XTSC063DD_

④ Pending UL approval.

⑤ Values in parentheses () are achieved without the current limiter.

⑥ Underscore (_) indicates magnet coil suffix required. See Table 9, Page 7.

Contactor and Overload Relay (Motor Starter) with Fused Disconnect

Table 5. 400/415V Type 2 Coordination — Contactor and Overload Relay (Motor Starter) with Fused Disconnect

P (kW)	I _e (A)	I _g (kA)	Fuses Class gG/gL	Contactor Catalog Number ①	Overload Relay Catalog Number	Assembled Starter Catalog Number ①
0.12	0.41	100.00	2	XTCE007B10_	XTOBP60BC1	XTAE007B10_P60
0.18	0.60	100.00	2	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.25	0.80	100.00	4	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.37	1.10	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
0.55	1.50	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
0.75	1.90	100.00	6	XTCE007B10_	XTOB2P4BC1	XTAE007B10_2P4
1.10	2.60	100.00	6	XTCE007B10_	XTOB004BC1	XTAE007B10_004
1.50	3.60	100.00	6	XTCE007B10_	XTOB004BC1	XTAE007B10_004
2.20	5.00	100.00	10	XTCE007B10_	XTOB006BC1	XTAE007B10_006
3.00	6.60	100.00	16	XTCE007B10_	XTOB010BC1	XTAE007B10_010
4.00	8.50	100.00	20	XTCE009B10_	XTOB010BC1	XTAE009B10_010
5.50	11.30	100.00	25	XTCE018C10_	XTOB016CC1	XTAE018C10_016
7.50	16.00	100.00	32	XTCE018C10_	XTOB016CC1	XTAE018C10_016
11.00	21.70	100.00	40	XTCE025C10_	XTOB024CC1	XTAE032C10_024
15.00	29.30	100.00	63	XTCE032C10_	XTOB032CC1	XTAE032C10_032
18.50	36.00	100.00	63	XTCE040D00_	XTOB040DC1	XTAE040D00_040
22.00	41.00	100.00	80	XTCE050D00_	XTOB057DC1	XTAE065D00_057
30.00	55.00	100.00	100	XTCE065D00_	XTOB057DC1	XTAE065D00_057
37.00	68.00	100.00	125	XTCE080F00_②	XTOB070GC1 ②	XTAE080F00_070 ②
45.00	81.00	100.00	160	XTCE095F00_②	XTOB100GC1 ②	XTAE095F00_100 ②
55.00	99.00	100.00	200	XTCE115G00_②	XTOB100GC1 ②	XTAE115G00_100 ②
75.00	134.00	100.00	200	XTCE150G00_②	XTOB150GC1 ②	XTAE150G00_150 ②
90.00	161.00	100.00	250	XTCE185L22_	XTOB220LC1	XTAE185L22_220
110.00	196.00	100.00	315	XTCE225L22_	XTOB220LC1	XTAE225L22_220
132.00	231.00	100.00	400	XTCE250L22_	XTOB250LC1	XTAE250L22_250

① Underscore (_) indicates magnet coil code required. See **Table 9, Page 7**.

② Contactor frames F and G to be released in December 2005. Contact Eaton Corporation for final Type 2 combinations.

Table 6. 500V Type 2 Coordination — Contactor and Overload Relay (Motor Starter) with Fused Disconnect

P (kW)	I _e (A)	I _g (kA)	Fuses Class gG/gL	Contactor Catalog Number ③	Overload Relay Catalog Number	Assembled Starter Catalog Number ③
0.12	0.33	100.00	2	XTCE007B10_	XTOBP40BC1	XTAE007B10_P40
0.18	0.48	100.00	2	XTCE007B10_	XTOBP60BC1	XTAE007B10_P60
0.25	0.70	100.00	2	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.37	0.90	100.00	2	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.55	1.20	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
0.75	1.50	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
1.10	2.10	100.00	6	XTCE007B10_	XTOB2P4BC1	XTAE007B10_2P4
1.50	2.90	100.00	6	XTCE007B10_	XTOB004BC1	XTAE007B10_004
2.20	4.00	100.00	10	XTCE007B10_	XTOB006BC1	XTAE007B10_006
3.00	5.30	100.00	16	XTCE009B10_	XTOB006BC1	XTAE009B10_006
4.00	6.80	100.00	16	XTCE009B10_	XTOB010BC1	XTAE009B10_010
5.50	9.00	100.00	20	XTCE012B10_	XTOB010BC1	XTAE012B10_010
7.50	12.10	100.00	25	XTCE018C10_	XTOB016CC1	XTAE018C10_016
11.00	17.40	100.00	32	XTCE025C10_	XTOB024CC1	XTAE025C10_024
15.00	23.40	100.00	50	XTCE040D00_	XTOB024DC1	XTAE040D00_024
18.50	28.90	100.00	50	XTCE040D00_	XTOB040DC1	XTAE040D00_040
22.00	33.00	100.00	63	XTCE050D00_	XTOB040DC1	XTAE050D00_040
30.00	44.00	100.00	80	XTCE065D00_	XTOB057DC1	XTAE065D00_057
37.00	54.00	100.00	100	XTCE080F00_④	XTOB070GC1 ④	XTAE080F00_070 ④
45.00	65.00	100.00	125	XTCE095F00_④	XTOB070GC1 ④	XTAE095F00_070 ④
55.00	79.00	100.00	160	XTCE115G00_④	XTOB100GC1 ④	XTAE115G00_100 ④
75.00	107.00	100.00	200	XTCE185L22_	XTOB125LC1	XTAE185L22_125
90.00	129.00	100.00	200	XTCE185L22_	XTOB125LC1	XTAE185L22_125
110.00	157.00	100.00	250	XTCE185L22_	XTOB160LC1	XTAE185L22_160
132.00	184.00	100.00	250	XTCE185L22_	XTOB220LC1	XTAE185L22_220
160.00	224.00	100.00	315	XTCE225L22_	XTOB250LC1	XTAE225L22_250

③ Underscore (_) indicates magnet coil code required. See **Table 9, Page 7**.

④ Contactor frames F and G to be released in December 2005. Contact Eaton Corporation for final Type 2 combinations.

Table 7. 690V Type 2 Coordination — Contactor and Overload Relay (Motor Starter) with Fused Disconnect

P (kW)	I _e (A)	I _g (kA)	Fuses Class gG/gL	Contactor Catalog Number ①	Overload Relay Catalog Number	Assembled Starter Catalog Number ①
0.12	0.24	100.00	1	XTCE007B10_	XTOBP40BC1	XTAE007B10_P40
0.18	0.35	100.00	2	XTCE007B10_	XTOBP40BC1	XTAE007B10_P40
0.25	0.50	100.00	2	XTCE007B10_	XTOBP60BC1	XTAE007B10_P60
0.37	0.70	100.00	2	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.55	0.90	100.00	4	XTCE007B10_	XTOB001BC1	XTAE007B10_001
0.75	1.10	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
1.10	1.50	100.00	4	XTCE007B10_	XTOB1P6BC1	XTAE007B10_1P6
1.50	2.10	100.00	6	XTCE007B10_	XTOB2P4BC1	XTAE007B10_2P4
2.20	2.90	100.00	10	XTCE007B10_	XTOB004BC1	XTAE007B10_004
3.00	3.80	100.00	10	XTCE007B10_	XTOB004BC1	XTAE007B10_004
4.00	4.90	100.00	16	XTCE009B10_	XTOB006BC1	XTAE009B10_006
5.50	6.50	100.00	16	XTCE012B10_	XTOB010BC1	XTAE012B10_010
7.50	8.80	100.00	20	XTCE018C10_	XTOB010CC1	XTAE018C10_010
11.00	12.60	100.00	25	XTCE025C10_	XTOB016CC1	XTAE025C10_016
15.00	17.00	100.00	32	XTCE032C10_	XTOB024CC1	XTAE032C10_024
18.50	20.90	100.00	32	XTCE040D00_	XTOB024DC1	XTAE040D00_024
22.00	23.80	100.00	50	XTCE040D00_	XTOB040DC1	XTAE040D00_040
30.00	32.00	100.00	63	XTCE065D00_	XTOB040DC1	XTAE065D00_040
37.00	39.00	100.00	80	XTCE080F00_ ②	XTOB050GC1 ②	XTAE080F00_050 ②
45.00	47.00	100.00	80	XTCE080F00_ ②	XTOB050GC1 ②	XTAE080F00_050 ②
55.00	58.00	100.00	100	XTCE080F00_ ②	XTOB070GC1 ②	XTAE080F00_070 ②
75.00	78.00	100.00	160	XTCE095F00_ ②	XTOB100GC1 ②	XTAE095F00_100 ②
90.00	93.00	100.00	160	XTCE115G00_ ②	XTOB100GC1 ②	XTAE115G00_100 ②
110.00	114.00	100.00	200	XTCE185L22_	XTOB125LC1	XTAE185L22_125
132.00	134.00	100.00	250	XTCE185L22_	XTOB160LC1	XTAE185L22_160
160.00	162.00	100.00	250	XTCE185L22_	XTOB220LC1	XTAE185L22_220

① Underscore (_) indicates magnet coil code required. See Table 9, Page 7.

② Contactor frames F and G to be released in December 2005. Contact Eaton Corporation for final Type 2 combinations.

Contactor and Overload Relay (Motor Starter) with Circuit Breaker

Table 8. 400/415V Type 2 Coordination — Contactor and Overload Relay (Motor Starter) with Circuit Breaker ^①

P (kW)	I _e (A)	I _g (kA)	Circuit Breaker	Contactor Catalog Number ^②	Overload Relay Catalog Number	Assembled Starter Catalog Number ^②
0.12	0.41	15.00	HMCPE003A0C	XTCE018C10_	XTOBP60CC1	XTAE018C10_P60
0.18	0.60	15.00	HMCPE003A0C	XTCE018C10_	XTOB001CC1	XTAE018C10_001
0.25	0.80	15.00	HMCPE003A0C	XTCE018C10_	XTOB001CC1	XTAE018C10_001
0.37	1.10	15.00	HMCPE003A0C	XTCE018C10_	XTOB1P6CC1	XTAE018C10_1P6
0.55	1.50	15.00	HMCPE003A0C	XTCE018C10_	XTOB1P6CC1	XTAE018C10_1P6
0.75	1.90	15.00	HMCPE007C0C	XTCE018C10_	XTOB2P4CC1	XTAE018C10_2P4
1.10	2.60	15.00	HMCPE007C0C	XTCE018C10_	XTOB004CC1	XTAE018C10_004
1.50	3.60	15.00	HMCPE007C0C	XTCE018C10_	XTOB004CC1	XTAE018C10_004
2.20	5.00	15.00	HMCPE007C0C	XTCE018C10_	XTOB006CC1	XTAE018C10_006
3.00	6.60	15.00	HMCPE015E0C	XTCE018C10_	XTOB010CC1	XTAE018C10_010
4.00	8.50	15.00	HMCPE015E0C	XTCE018C10_	XTOB010CC1	XTAE018C10_010
5.50	11.30	15.00	HMCPE015E0C	XTCE018C10_	XTOB016CC1	XTAE018C10_016
7.50	16.00	15.00	HMCPE030H1C	XTCE018C10_	XTOB024CC1	XTAE032C10_024
11.00	21.70	15.00	HMCPE030H1C	XTCE025C10_	XTOB024CC1	XTAE032C10_024
15.00	29.30	15.00	HMCPE050K2C	XTCE032C10_	XTOB032CC1	XTAE032C10_032
18.50	36.00	15.00	HMCPE100R3C	XTCE040D00_	XTOB040DC1	XTAE040D00_040
22.00	41.00	15.00	HMCPE100R3C	XTCE050D00_	XTOB057DC1	XTAE065D00_057
30.00	55.00	15.00	HMCPE100R3C	XTCE065D00_	XTOB065DC1	XTAE065D00_065
37.00	68.00	50.00	HMCJP250D5L	XTCE080F00_ ^③	XTOB070GC1 ^③	XTAE080F00_070 ^③
45.00	81.00	50.00	HMCJP250F5L	XTCE095F00_ ^③	XTOB100GC1 ^③	XTAE095F00_100 ^③
55.00	99.00	50.00	HMCJP250G5L	XTCE115G00_ ^③	XTOB125GC1 ^③	XTAE115G00_125 ^③
75.00	134.00	50.00	HMCJP250G5L	XTCE150G00_ ^③	XTOB150GC1 ^③	XTAE150G00_150 ^③
90.00	161.00	50.00	HMCJP250W5L	XTCE185L22_	XTOB220LC1	XTAE185L22_220
110.00	196.00	50.00	HMCPL600N	XTCE300M22_	XTOT240C3S	XTAE300M22_240
132.00	231.00	50.00	HMCPL600R	XTCE300M22_	XTOT290C3S	XTAE300M22_290
160.00	279.00	50.00	HMCPL600X	XTCE300M22_	XTOT400C3S	XTAE300M22_400

^① All Type 2 circuit breaker combinations are pending KEMA certification.

^② Underscore (_) indicates magnet coil code required. See **Table 9**.

^③ Contactor frames F and G to be released in December 2005. Contact Eaton Corporation for final Type 2 combinations.

IMPORTANT: Additional testing at 480V, 525V, 600V, and 690V is in progress. Please contact Eaton Corporation for results.

Table 9. Magnet Coil Suffix

Coil Voltage	Suffix Code
Frame A – B	
110V 50 Hz, 120V 60 Hz	A
220V 50 Hz, 240V 60 Hz	B
230V 50 Hz	F
24V 50/60 Hz	T
24V DC	TD ^④
415V 50 Hz, 480V 60 Hz	C
550V 50 Hz, 600V 60 Hz	D
208V 60 Hz	E
190V 50 Hz, 220V 60 Hz	G
240V 50 Hz, 277V 60 Hz	H
380V 50 Hz, 440V 60 Hz	L
400V 50 Hz	N
380V 60 Hz	P
12V 50/60 Hz	R
24V 50 Hz	U
42V 50 Hz, 48V 60 Hz	W
48V 50 Hz	Y
120V DC	AD ^④
220V DC	BD ^④
12V DC	RD ^④
48V DC	WD ^④

Coil Voltage	Suffix Code
Frame C – F	
110V 50 Hz, 120V 60 Hz	A
220V 50 Hz, 240V 60 Hz	B
230V 50 Hz	F
24V 50/60 Hz	T
24 – 27V DC	TD ^④
415V 50 Hz, 480V 60 Hz	C
550V 50 Hz, 600V 60 Hz	D
208V 60 Hz	E
190V 50 Hz, 220V 60 Hz	G
240V 50 Hz, 277V 60 Hz	H
380V 50 Hz, 440V 60 Hz	L
400V 50 Hz	N
380V 60 Hz	P
12V 50/60 Hz	R
24V 50 Hz	U
42V 50 Hz, 48V 60 Hz	W
48V 50 Hz	Y
110 – 130V DC	AD ^④
200 – 240V DC	BD ^④
12 – 14V DC	RD ^④
48 – 60V DC	WD ^④

Coil Voltage	Suffix Code
Frame G	
100 – 120V 50/60 Hz	A
190 – 240V 50/60 Hz	B
24V 50/60 Hz	T
24 – 27V DC	TD ^④
480 – 500V 50/60 Hz	C
380 – 440V 50/60 Hz	L
42 – 48V 50/60 Hz	W
110 – 130V DC	AD ^④
200 – 240V DC	BD ^④
48 – 60V DC	WD ^④
Frame L – M	
110 – 250V 40 – 60 Hz/DC	A
250 – 500V 40 – 60 Hz/DC	C
48 – 110V 40 – 60 Hz/DC	Y ^④
24 – 48V DC	TD ^④

^④ With DC operation: Integrated diode-resistor combination, coil rating 2.6W.

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